The invention comprises a motorised toilet seat assembly allowing for the raising and lowering of the lid (102) or seat (101) in relation to user requests or automatic sensing (110). A remote control device (200) with touch switches or sensors (201) can be provided, which can communicate with control apparatus by wired or wireless communication. Alternatively, or additionally, sensors mounted on the various components of the toilet can effect certain operations automatically, including raising or lowering the seat lid, flushing of the toilet, and the operation of auxiliary devices such as sanitary sprays, occupancy indicators, or emergency call systems. Described are embodiments which can be retrofitted to existing toilet seat assemblies as well as ready to install embodiments.
Figure 1
POWERED TOILET & SEAT ASSEMBLY

FIELD OF INVENTION

[0001] The present invention is directed to a toilet seat assembly which provides for the powered raising and/or lowering of either or both the lid and seat. Remote control of these operations may be provided for, though may also rely on provision for operation in response to certain sensed actions or other predetermined criteria.

BACKGROUND DESCRIPTION

[0002] Commonly, toilet seats and lids are manually raised according to user preference—often dictated by gender. Domestic arguments about leaving toilet seat lids up or down appear to occur be an international. While such disagreements may be based on convenience, in public restrooms it is often for sanitary reasons that patrons are reluctant to touch and raise or lower seats.

[0003] A solution to this problem would ideally be simple so that retrofitting to existing toilets, and without substantial modification to the toilet, was possible. Ideally such a solution would be able to be applied to an existing or available seat and lid assembly—often these are easily detachable from the toilet pan or cistern assembly.

[0004] Advantages for users including addressing phobias associated with toilet seats, and reducing communicable diseases by reducing hand contact. Other advantages may be potentially realisable.

[0005] It is therefore an object of the present invention to consider the above problems and provide at least one solution thereto. Ideally the present invention will also provide a method and apparatus for effecting the powered raising and/or lowering of a toilet seat and/or cover. At the very least the present invention seeks to provide the public with a useful alternative.

GENERAL DESCRIPTION OF THE INVENTION

[0006] Further objects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

[0007] According to one aspect of the present invention there is provided a powered toilet seat assembly including at least one motor and associated drive assembly for transmitting a rotational drive to effect raising and/or lowering of a hinged component of the toilet seat assembly; there also being included a power source or provision for the connection of a power source; the arrangement including means for at least one of:

[0008] remotely controlling a powered operation,

[0009] sensing an event and initiating a powered operation,

[0010] determining a timed interval or time related parameter and initiating or ceasing an operation.

[0011] According to one aspect of the present invention there is provided control apparatus for controlling the raising and lowering of components of a toilet seat assembly, said control apparatus comprising:

[0012] a controller which receives and evaluates information about the status of at least the seat, and instructs operation of one or more said components;

[0013] a motor control interface, in communication with said controller and effecting control of at least one motor to effect at least a raising or lowering operation of components of said toilet seat assembly.

[0014] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is also included:

[0015] a receiver interface in communication with the controller and receiving instructions from a user about at least raising or lowering operation of components of the toilet seat assembly;

[0016] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is also included a flush sensor for determining at least one of:

[0017] that the toilet with which the seat assembly is associated has been flushed,

[0018] that a flush has been initiated in the toilet with which the seat assembly is associated, and

[0019] that a flush cycle has substantially ended in the toilet with which the seat assembly is associated.

[0020] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included toilet seat status sensing means for determining at least one of:

[0021] that the toilet seat is in the down position;

[0022] that the toilet seat has substantially reached the down position when being lowered;

[0023] that the toilet seat is in the upright position;

[0024] that the toilet seat has substantially reached the upright position when being raised;

[0025] that the toilet seat has encountered resistance while being raised;

[0026] that the toilet seat has encountered resistance while being lowered;

[0027] that the toilet seat is moved from a stationary position.

[0028] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the toilet seat status sensing means includes motor load sensing means for a motor associated with raising or lowering of said toilet seat.

[0029] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included toilet seat directional sensing means for determining either or both of the direction of resistance to travel of the toilet seat, and movement of the toilet seat from a stationary position.

[0030] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the toilet seat directional sensing means monitors the polarity of a motor's electrical inputs.
According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included toilet seat lid status sensing means for determining at least one of:

- that the toilet seat lid is in the down position;
- that the toilet seat lid has substantially reached the down position when being lowered;
- that the toilet seat lid is in the upright position;
- that the toilet seat lid has substantially reached the upright position when being raised;
- that the toilet seat lid has encountered resistance while being raised;
- that the toilet seat lid has encountered resistance while being lowered;
- that the toilet seat lid is moved from a stationary position.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the toilet seat lid status sensing means includes motor load sensing means for a motor associated with raising or lowering of said toilet seat lid.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included toilet seat lid directional sensing means for determining either or both of the direction of resistance to travel of the toilet seat, and movement of the toilet seat from a stationary position.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the toilet seat lid directional sensing means monitors the polarity of a motor's electrical inputs.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included additional sensing means for determining either or both of the status of the toilet, or events in the immediate environment of the toilet.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the additional sensing means comprises a proximity sensor detecting the presence of a person in the immediate vicinity of the toilet.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is included auxiliary control means for controlling, upon instruction from the controller, an auxiliary device.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the auxiliary device comprises a sanitary spray device whose output is directed in the vicinity of the bowl and/or toilet seat.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is provided a proximity sensor and a sanitary spray device wherein operation of the sanitary spray device is prevented if the proximity sensor detects a presence in its detection area.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is also included timer delay means which allows for introduction of a delay before certain operations may be commenced following certain events, or detected states.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which there is provided at least one user control allowing a user to effect one or more operations.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which a user control communicates with the receiver interface by means of at least one of: a wired connection, a wireless infrared connection, a wireless ultrasonic connection, a wireless RF connection, or other wireless communication means.

According to a further aspect of the present invention there is provided control apparatus which includes a controller which receives and evaluates information about the status of at least the seat, and instructs operation of one or more said components, said controller interacting with at least:

- a receiver interface in communication with the controller and receiving instructions from a user about at least raising or lowering of operation of components of the toilet seat assembly;
- a motor control interface, in communication with said controller and effecting control of at least one motor to effect at least a raising or lowering operation of components of said toilet seat assembly;
- a flush sensor determining at least one of the initiation, end, or presence of a flush operation of the toilet;
- at least one of toilet seat status sensing means and toilet seat lid status sensing means, a said status sensing means being able to detect at least one of position, direction of travel, and movement from stationary of the seat or lid with which it is associated.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which a said status sensing means interacts with a said motor control interface to detect at least one of: the presence of a current and/or voltage across the motor's input terminals, changes in load on the motor, resistance across the motor, changes in current across the motor, and changes in voltage across the motor.

According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the controller effects at least one of the following:

- completes raising of a toilet seat if it is detected that the toilet seat is being manually lifted;
- completes lowering of a toilet seat if it is detected that the toilet seat is being manually lowered;
[0059] completes raising of a toilet seat lid if it is detected that the toilet seat lid is being manually lifted;
[0060] completes lowering of a toilet seat lid if it is detected that the toilet seat lid is being manually lowered;
[0061] completes raising of a toilet seat lid in a raising operation of the toilet seat;
[0062] effects an operation causing both the toilet seat and toilet seat lid to assume a lowered position if flushing of the toilet occurs;
[0063] pauses a raising or lowering operation if a resistance to travel is determined partway through said operation;
[0064] reverses a raising or lowering operation if a resistance beyond a threshold is determined partway through said operation.

[0065] According to another aspect of the present invention there is provided control apparatus, substantially as described above, in which the controller effects at least one of the following:
[0066] a delay between successive raising or lowering operations;
[0067] operation of an auxiliary device providing certain sensing conditions are met;
[0068] operation of an auxiliary device providing either or both the toilet seat and toilet seat lid are in a preferred position.

[0069] According to a further aspect of the present invention there is provided a motorised toilet seat assembly comprising at least a toilet seat, a motor capable of effecting at least raising of said toilet seat, and control apparatus, substantially as described above, for controlling same.

[0070] According to a further aspect of the present invention there is provided a motorised toilet seat assembly allowing user control of operation, said assembly including at least a toilet seat, a motor capable of effecting at least the raising of said toilet seat, and control apparatus, substantially as described above, which includes a receiver interface in communication with the controller and receiving instructions from a user about at least raising or lowering operation of components of the toilet seat assembly.

[0071] According to a further aspect of the present invention there is provided a motorised toilet seat assembly allowing fully automated control of operation, said assembly including at least:
[0072] a toilet seat,
[0073] a motor capable of effecting at least the raising and lowering of said toilet seat,
[0074] control apparatus, substantially as described above which includes a flush sensor, and wherein said control apparatus effects appropriate raising and lowering operations of the toilet seat in response to at least one of: flushing of the toilet with which the assembly is associated, after predetermined time delay, and in response to detected manual actions on the toilet seat.

[0075] According to a further aspect of the present invention there is provided a toilet seat assembly including at least one motor and associated drive assembly for transmitting rotational drive to effect raising and/or lowering of a hinged component of the toilet seat assembly; there also being included a power source or provision for the connection of a power source; the arrangement including means for at least one of:
[0076] remotely controlling a powered operation,
[0077] sensing an event and initiating a powered operation,
[0078] determining a timed interval or time related parameter and initiating or ceasing an operation.

[0079] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, which includes flushing means for automatically flushing the toilet.

[0080] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, in which the flushing means allows for part or full flushing.

[0081] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, in which at least some components are mounted in a cistern associated with the toilet seat assembly.

[0082] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, which includes an emergency call system.

[0083] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, in which the emergency call system activates after it detects the presence of a person in the vicinity of the toilet for a period exceeding a predetermined interval.

[0084] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, in which the occupant is pre-warned before an emergency call is sent, and is able to reset the system.

[0085] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, in which there is included an associated occupancy indicator whose display is influenced by the status of the toilet or its occupancy.

[0086] According to another aspect of the present invention there is provided a toilet seat assembly, substantially as described above, which includes control apparatus substantially as described above.

[0087] According to another aspect of the present invention there is provided a kitset for modifying a toilet seat assembly which includes:
[0088] control apparatus substantially as described above;
[0089] a power source and/or means for the connection or placement of same;
[0090] at least one motor and associated transmission means for effecting at least one of raising or lowering either or both the toilet seat and toilet seat lid;
According to another aspect of the present invention there is provided a method for the electrically powered lifting and/or lowering of the seat and/or lid of a toilet seat assembly which provides for at least one function of:

- remote controlled operation of a lifting or lowering operation;
- automatic lowering upon flushing,
- automatic lowering after a time interval,
- sensing manual raising or lowering and completing the attempted operation.

According to another aspect of the present invention there is provided a method for the electrically powered lifting and/or lowering of the seat and/or lid of a toilet seat assembly which provides for at least one function of:

- remote controlled operation of a lifting or lowering operation;
- automatic lowering upon flushing,
- automatic lowering after a time interval,
- sensing manual raising or lowering and completing the attempted operation.

The present invention provides a toilet seat assembly, and parts therefor, for the powered lifting and/or raising of at least the seat portion. Preferably the lid can also be similarly controlled. Control may be initiated in a number of manners including but not restricted to; by remotely located control unit(s), in response to certain actions (such as flushing, or filling of a water cistern), after particular timed intervals, by sensing manual movement of the seat or lid by a user, and/or in response to proximity and/or motion sensors and the like.

Preferably the present invention comprises a powered toilet seat with lid assembly. Typically these are sold as a substantially complete assembly which can be fastened to the toilet bowl, and are commonly separate from the toilet cistern. While various types of assemblies are suitable for use with the present invention, for the purpose of retrofitting it is preferable that a toilet seat with lid assembly is used that can be fitted to an existing bowl without the need for replacing the cistern.

Having said this, complete cistern and seat assemblies are included within the scope of the invention. At least one preferred embodiment relying on proximity sensors mounts several components within the cistern. While these can be retrofitted, it is envisaged that factory ready models comprising the entire cistern and seat assemblies are able to be provided.

A powered toilet seat assembly according to the present invention will typically include a toilet seat assembly (such as described above) in combination with a motor for effecting movement of at least the seat or lid, and control apparatus for controlling same, and ideally a power supply or provision for connection to same.

In its simplest form the control apparatus may merely comprise means for accepting an input signal (indicating the user’s selection) which then typically effects a raising and/or lowering operation on the seat and/or lid. However, in preferred embodiments of the present invention the control apparatus is more sophisticated and provides for additional features. For simplicity of description, one currently preferred arrangement of control apparatus will be described. However it should be appreciated when reading this description that other embodiments exist which may possess only some of the features of the preferred embodiment, as well there being embodiments which include features over and above what are described, or subsets and additions thereof.

Control apparatus for use with the present invention may be configured to be mounted within a toilet seat assembly. This arrangement is preferred in some embodiments to be described later, though it is also possible that control apparatus may be positioned separately or remotely to the actual toilet seat assembly. In such cases it may communicate with components housed in the toilet seat assembly (such as the motor, motor controllers, or auxiliary devices) by wired and/or wireless communication.

Ideally the control apparatus will share the same power source as the motor, though this is largely a matter of user choice and separate power supplies may be used. In preferred embodiments a storage device such as a cell or battery is relied upon to power the various components of the powered toilet seat assembly, though provision may be made for connection to an external or permanent power supply. As can be appreciated, mains voltage power supply should ideally be avoided, and it is likely that any such power supply will be low voltage, typically under 12 volts, and preferably 6 volts or less. However local regulations and requirements may dictate these types of parameters.

In the preferred embodiment the control apparatus includes a number of sensing inputs, and an evaluating controller able to evaluate the information from such inputs, to then cause to effect the appropriate action at the powered toilet seat—e.g. lifting and/or lowering of the seat and/or lid. In one preferred embodiment, flush sensing means is included which senses if there is flushing of the toilet. This may include sensing the initiation of the flush, that a flush is occurring, or the end of a flush. When auxiliary devices such as a sanitary spray unit are included, it is generally desirable to determine when flushing has stopped. However other auxiliary devices may be timed differently.

Different sensing means may also be relied upon for detecting flushing. Sensors which determine the water level in the cistern may be used, though these will require additional wiring (or wireless communication) between the sensor in the cistern and the control apparatus. This may not represent a problem in embodiments in which control apparatus is provided within the cistern, or automated flushing is provided.

An additional power supply may also be required for such remotely positioned sensors. A similar problem may also exist (in some designs) for devices placed within the
plumbing between cistern and bowl and which detect a flow of water. To avoid such problems or inconvenience associated with additional wiring and the routing of power to sensors in some embodiments, one preferred embodiment uses a sound sensor whose input is preferably filtered substantially to the sound spectrum region associated with the flushing of the toilet. Such a sensor is able to be mounted in the toilet seat assembly where its close proximity to the bowl locates it ideally for detecting by sound the flushing of the toilet. The sensor may have adjustable and/or preset thresholds to determine substantially the end of flushing. A delay circuit may be provided to introduce an additional time delay for delaying the start of any specific operation or action after the flush sensor has determined that flushing has stopped. This is to allow for any residual draining of the cistern which may not be of sufficient volume to activate the sound sensor. This is a preferred solution of the inventor, though it should be envisaged that other alternatives may be considered and employed in various embodiments.

[0113] In a second preferred embodiment use is made of a proximity sensor to initiate various actions. In this embodiment there is a first proximity sensor preferably positioned in the toilet cistern, or its lid—though may be placed elsewhere and even remotely from the toilet assembly (e.g. in a wireless remote sensing or remote control unit)—ideally in a substantially forward facing direction. It may be angled downwardly to be able to detect a range of differently sized users. The range of the sensor may be adjustable, to allow a user to set up a system according to appropriate local needs, though a standardised proximity range of around 800±200 mm may be used.

[0114] In this embodiment, anyone approaching the toilet will ultimately interact with this proximity sensor. At this stage various actions may be initiated, though the preference is for lifting of the toilet lid portion, which is usually closed after any previous flushing operation of this embodiment. If it is decided that the toilet seat should also be raised then the second switch or sensing device may be used to initiate this, though the apparatus could be programmed to lift the toilet seat by preference. In this preferred embodiment a second proximity sensor directed upwardly is provided on the lid of the cistern. This typically has a much shorter range of around 100-150 mm. In this particular arrangement the person merely waves their hand over the sensor to initiate raising of the toilet seat. This may also operate according to a toggle action so that the second triggering of this second proximity sensor will cause the seat to re-lower, and so on. It is also envisaged that the second proximity sensor, as for the first, could be substituted by a range of other switching or sensing devices. A push button switch could be used for instance. A remote control unit could be used for such functions. A remote control unit could conceivably also include a proximity sensor switch to substitute (or additionally to) the cistern proximity switch.

[0115] Flushing may be accomplished by a number of means. Ideally there is provided a manual flush switch or sensor on the cistern itself (though other options such as discussed above can be considered). This can then be used to activate flushing of the cistern, lowering of the toilet seat if lifted, and closing of the toilet seat lid. Any auxiliary devices, such as a sanitary spray unit, or injection device for disinfectant into the flushing water stream, can be activated as appropriate.

[0116] Other methods of initiating this series of actions may also be relied upon. In this second preferred embodiment there is provided a manual flush button. However, automatic initiation of this segment is accomplished (should the user forget to push this manual flush button or sensor) by means of the output of the first proximity sensor which faces forwardly. When this proximity sensor no longer detects the presence of a person, either standing in front of the toilet pan, or sitting on the toilet seat, then it will initiate the flushing and closing/lowering sequences.

[0117] Optionally there, may be a built in time delay, after the sensor no longer detects a person, before these actions are initiated. This may optimally be around three seconds. If someone then re-enters within the range of the sensor within this three second period then the flushing and closing operations are aborted, and will not be reinitiated until the person moves out of sensor range for the pre-designated minimum period. Of course the option for manual flushing remains, where this feature is provided.

[0118] Other options may also be provided. Many jurisdictions require that toilets be to half flush in order to conserve water. In the second preferred embodiment this is accommodated for by the control interface detecting whether the toilet seat (as opposed to lid) is in the up position. If it is in the up position then only a half flush will be provided. If it is detected in the down position then a full flush will be provided. If a half flush, or even a full flush, is insufficient for full flushing of the contents of the toilet pan, then the user has the option of using the optionally provided manual ‘flush’ button.

[0119] Also associated with some preferred embodiments of a control apparatus is an interface able to receive instructions from the user, and/or perhaps another source (e.g. a central monitoring station or controller). While some embodiments of the present invention may provided with a wired connection between the user controls and the control apparatus, a number of preferred embodiments utilise a wireless system. This may be infrared, an alternative photo electric system, ultrasonic, RF, or other available means of wireless communication. However, many local requirements and regulations tend to preclude the use of RF and thus ultrasonic or (visible or non-visible) ‘light’ based systems (e.g. infrared) are preferred.

[0120] In the preferred wireless arrangement, there is provided a remote control unit enabling a user to perform certain actions. What actions the user is able to effect are largely a matter of user choice. In the preferred arrangement there may be controls enabling a user to lift the lid only, lift both lid and seat, or lower both. An option may also be provided to allow the user to also flush the toilet from the same remote control, though this would require additional equipment placed within the cistern. This is therefore more of an optional extra, and likely included as an auxiliary feature of the present invention. The control apparatus may also accommodate further sensor inputs for evaluation. For instance, a proximity sensor is included in the preferred embodiment and detects the presence of a person in close proximity to the toilet bowl. In the preferred embodiments this information can be used to prevent operation of an auxiliary sanitary sprayer, and also to prevent lowering of the lid or raising of the seat if someone is thought to be sitting on the lowered seat. The information can be used in
other ways. Other uses for sensors within the remote control unit have been discussed above.

[0121] Also provided for in some preferred embodiments are motor sensing means, though these are associated with the motor interface (to be described later) which can sense the status of the seat or lid. For instance, if resistance to travel of either is detected during a raising or lowering operation, or if it is detected that one or the other is being moved from a stationary position, then appropriate actions may be effected by the control apparatus. This will be discussed further later.

[0122] The control apparatus evaluates information from the various sensors and input interfaces, and effects various operations as it has been instructed. Generally such instructions are a matter of user choice at the time of assembly or manufacture, though some embodiments may allow individual user preferences to be stored in the machine to govern the operation of the control apparatus.

[0123] The evaluation portion of the control apparatus may be hard wired (e.g. non-programmable), though may also include a processor, or various logic circuits, and/or memory etc., which may allow for the provision of instructions by which the control apparatus operates.

[0124] In the preferred embodiment the control apparatus also includes a motor control interface which communicates between the controller and motor (or associated electronics) to effect at least the raising, lowering, or movement of the components with which the motor is associated. Quite simply this interface may provide power to the motor in response to a signal from the main portion of the controller (evaluating the various information) of the control apparatus. The polarity of the power supplied to the motor may be altered to affect motion of the components in the correct direction. A timer may be associated with the interface to cause operation of the motor for a pre-determined, or variable, period of time once initiated. This period of time may be calculated in advance to reflect the nominal amount of time required to perform a raising or lowering operation. Load sensors may also be active to stop a motor when resistance (either by human interaction, or when full travel has occurred) of sufficient magnitude is detected—see also below.

[0125] In at least one preferred arrangement a more sophisticated arrangement is used. Associated with the motor control interface is a sensing arrangement which is able to detect or sense various load characteristics on the motor. For instance, in one preferred embodiment the increasing load on the motor, when it encounters a resistance (such as being fully up or fully down), is detected and signals that it is time to cease motor operation. Such an arrangement is also useful if resistance, such as from human intervention, is encountered partway through a lifting or lowering operation. In such a case, motor operation would cease and the seat or lid would remain in the midway position.

[0126] The sensing portion associated with motor control interface may optionally also be able to detect movement of the lid and/or seat from stationary. This is also based on a fairly well known principle that most motors can also act as generators. Therefore the presence of a voltage and/or current across the input terminals of the motor can be detected and evaluated as reflecting an external force (such as user intervention) effecting movement of the seat and/or lid from stationary. The evaluating controller of the control apparatus and/or motor control interface may evaluate this information and cause the motors to begin operation to complete movement of the seat and/or lid in the detected direction. Hence a user, who may be unfamiliar with the powered seat and lid arrangement, attempting to lift the seat will cause the powered system to take effect and complete the lifting operation for them.

[0127] Such an arrangement may also be useful for when resistance is encountered part way through a lifting or raising operation. If the seat and/or lid are stopped (due to resistance or intervention) at, say, a 45 degree angle then the weight of the seat and lid may cause them to slowly lower towards the lowered position. This movement would be detected by the sensing means and the motor operated to complete the lowering operation.

[0128] The evaluating controller of the control apparatus may perform additional evaluations. For instance in the preferred embodiments, operation of the auxiliary sanitary sprayer will not operable unless both the seat and the lid are in the down position, as well as there being no detected presence (of the person) in the bowl. For instance, flushing may cause a number of events to occur including providing there is no person in the immediate area. This may include the lowering of both lid and seat, and the activation of a spray pulse from the sanitary spray unit once the evaluated controller considers that lid and seat are in the down position. Other various features and options may be implemented according to user choice and, as indicated previously, additional sensors may be provided to increase the number of user choices and sophistication of the unit.

[0129] Lowering of the seat and/or lid is generally by motor. In the preferred arrangement independent motors are used for each of the seat and lid. A single motor may be used, though this would complicate the transmission means where independent movement of the seat and lid are required. Hence, for simplicity, the preferred arrangement uses a separate motor and associated gearbox for each of the seat and lid.

[0130] In most toilet seats assemblies which are available, there is a hinge portion towards the rear. In modern plastic injection moulded assemblies this portion is generally hollow and is ideal for housing various components associated with the present invention. Seats of other types of construction and arrangement may require varying degrees of modification to implement the present invention. However, a significant number of suitable toilet seat arrangements are commercially available which require only minimal, if any, modifications before the present invention can be implemented.

[0131] These will be seen in the detailed description of the preferred embodiment, in which the motor and associated gearbox are positioned axially (with the axis of pivoting for the seat and lid) and ideally connected such that the motor is fastened with respect to the securing portion of the assembly (which fastens the toilet seat assembly to the bowl). The output shaft of the gearbox is then ideally fastened with respect to the seat and/or lid with which it is associated. Typically the motor and gearbox are positioned at the outer ends of the hinge portion of the toilet seat
assembly. This generally leaves a cavity near or in between the two motor/gearbox arrangements and into which the control apparatus and suitable power source may be fitted. In the preferred arrangement, the entire apparatus apart from the remote control unit for the user, can be fitted and hidden within the existing structure of the toilet seat assembly. Furthermore, this enables fitting of the seat assembly in the normal traditional manner and does not require any additional installation steps, or variations from standard practice, for the installer. This is quite a significant feature, as in many countries the need to vary from standard installation practice can have a significant effect on installation costs, and the commercial viability and acceptability of plumbing products. As can be appreciated, this also simplifies substitution of a powered toilet seat assembly (according to the present invention) for an existing non-powered toilet seat assembly.

[0132] Within the scope of the invention there is provided a powered toilet seat assembly which includes the various components enabling powered lifting and/or raising of the seat and/or lid. Such an assembly may be merely substituted for an existing toilet seat to provide the features associated with the present invention. Also associated with the present invention is a kitset including various components, including at least control apparatus, motors and associated transmission means, and optionally other components, which allows modification of a standard toilet seat assembly into a powered toilet seat assembly according to the present invention.

[0133] The present invention also includes control apparatus substantially as described therein, which may also be combined with a user’s choice of motor, power source, and other features for effecting a powered toilet seat assembly according to the present invention.

[0134] Further aspects of the present will become apparent from the following description directed to preferred embodiments of the present invention described in association with the drawings.

DESCRIPTION OF DRAWINGS

[0135] FIG. 1: is a schematic view of a preferred embodiment of control apparatus according to the present invention,

[0136] FIG. 2: is a diagrammatic underside view of toilet seat assembly incorporating components to enable the lifting and lowering of the associated seat and lid,

[0137] FIG. 3: is a perspective diagrammatic view of an alternative embodiment of the present invention, and

[0138] FIG. 4: is a perspective side view of the embodiment of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENT

EXAMPLE 1

[0139] FIG. 1 illustrates control apparatus associated with a preferred embodiment of the present invention. The heart of the unit is an evaluation controller which receives various inputs, evaluates the information and causes certain actions to occur.

[0140] The remotely locatable control unit (remote control) (2) interfaces with a receiver (3) via infrared wireless communication. Information transmitted from the control unit (2) is input into the evaluation controller (1). This enables a user to effect certain actions with the seat and lid.

[0141] A flush sensor (4) is based on a sound detector and monitors the characteristic noises associated with flushing of the toilet. An electronic filter is provided with a sensor to evaluate sensitivity to the region most closely associated with the sound of running water during the flushing. Adjustments may be provided to allow adjustment for individual toilets to be made during installation.

[0142] The proximity sensor (5) is also provided to detect the presence of a person on the seat. This may comprise a single pressure switch though more preferably a sensor of the type commonly used for alarms, such as commonly operate on ultrasound or infrared, may be employed. Such a sensor may be positioned near the rear of the seat assembly and in close proximity to the main control board including the components of the control apparatus. Such a sensor may only operate in specified periods and on demand, such as in preparation for certain operations. This will result in potential power savings. Alternatively, a sensor which detects that the seat and lid are in the down position may be considered instead, based on the rationale that the toilet is not occupied when the lid is down. This may be an additional or alternative pre-requisite for some operations such as activating a sanitary sprayer.

[0143] Additional sensors (6 and 7) may be provided to monitor other parameters such as, for instance whether it is dark or light - darkness indicating that it is unlikely that the person is present etc. Such additional information may be used by the evaluation controller (1) in performing various additional functions according to user preference.

[0144] One or more circuits may be provided to allow for the introduction of delays. For instance, once flushing has been determined by the flush sensor (4) to have ceased (i.e. the sound level has dropped below a predetermined threshold) a time delay may still be relied upon to allow for residual draining of the water cistern before certain operations (e.g. operation of the sprayer (10)) occur.

[0145] An auxiliary interface portion (9) is provided to enable the controller (1) to operate various auxiliary equipment. A sanitary spray unit (10) is one such auxiliary device, and can be mounted again at the rear of the toilet in close proximity to the remainder of the components associated with the present invention. In operation, it may be a pre-requisite that the proximity sensor (5) or alternative sensor indicates that no one is present. It may be an additional requirement that both the seat and lid are in the down position, which may require the controller to remember what position the seat and lid are in. Various other methods of implementation and control may be adopted.

[0146] Provision is also made for additional auxiliary devices (11) to be incorporated. These may include panic alarms enabling the user to signal for assistance via the control unit (2). This may send a signal to a remote receiver which is monitored remotely as part of a monitoring system. Such alarms are common in hospitals and rest homes.

[0147] Another auxiliary device which could be implemented was one which indicated malfunction or the need for attention to the unit. This, for instance, could indicate various information such as replacement of the battery being required, topping up of the sanitary spray unit reservoir, or
various other conditions which may be require different types of attention. Such an auxiliary indicator may signal a remote sensor, or may merely consist of a flashing LED or similar device on or near the unit which can be seen by a person monitoring the unit.

[0148] Additional extra features may be built into the control apparatus. Through its sensors, the evaluation controller can receive information about the unit which could be stored for future processing. For instance, the number of operations (e.g. raising and lowering) could be recorded or downloaded locally or remotely. This and other types of information may be downloaded by interfacing with the evaluation controller. This may be by plug in connection or by wireless connection, such as infrared communication. Such communication may proceed via the auxiliary interface (9). Such information may be useful for determining projected battery power life, and the extent of use of the toilet (which may influence cleaning schedules for toilets in public use).

[0149] In order to effect raising and lowering operations, two monitor control interfaces (12, 14) are provided. Each interacts with a motor controller portion (15, 16) which can directly control the motors (17, 18). Associated with motor controllers (15, 16) are load sensors (19, 20) and polarity sensors (21, 22). These monitor the state of the motors (17, 18) to determine various factors such as load or resistance experienced by the motor, and any movement from stationary. The information from these sensors (19-22) can be fed back to the associated motor control interfaces (12, 14) which can then provide information to the evaluation controller (1). This may then modify any current operations of motor (17, 18), or initiate new operations.

[0150] Ideally the load sensor will be able to monitor when a moving lid or seat encounters resistance to further movement. In normal operation this is indicative that the lid and/or seat has reached the end of its travel e.g. it is in a fully upright or lowered position, or someone has interfered with its travel. This feedback can then enable the motor (17, 18) to be stopped. Such evaluation control may occur via the evaluation controller (1), though may also be evaluated and acted upon within the motor control interfaces (12, 14).

[0151] In a non-normal state, human intervention may stop raising or lowering of a seat or lid part way through its travel. Again the perceived resistance will be evaluated with the result that further travel of the seat or lid will be halted. This can help avoid excessive power drain and potential burning out of the motor.

[0152] The polarity sensor is intended to determine movement of a seat or lid from substantially stationary. This relies upon the fact that most motors are able to act as a generator. If such movement is detected (other than by powered operation via the motors (17, 18)) the evaluation controller (1) and/or motor control interface (12, 14) can instruct the motor (17, 18) to operate so as to complete movements of the effected seat or lid in the perceived direction of travel.

[0153] FIG. 2 illustrates from below, the underside of a lid (13) and seat (31) assembly (arrow 32). The illustrated embodiment is based on Caroma® brand toilet seat. This particular model used is a Regal Heavy Duty toilet seat which is widely available in Australia and New Zealand. This model is particularly suitable as its rear section (34), which comprises the hinge portions and fixing portions for connection to a bowl, is substantially hollow and allows mounting of the various components of the invention. It should be appreciated however that a specifically designed toilet seat and lid which houses the various components may be considered.

[0154] Within the rear portion (35), which is used for fixing the seat assembly to a bowl, there is a central hollow portion which is ideal for locating the main control card (36) and a power source (37).

[0155] The adjacent hinge portions are also substantially hollow and are ideal for housing various components associated with the motor and drive means for transmitting motor drive to the lid (30) or seat (31).

[0156] For instance in the left hand portion of FIG. 2 is a motor (38) and gear box (39) associated with raising and lowering the lid (30). In test prototypes, a Tamnay® planetary gear box with motor kitset was used. Such kit sets are widely available from model shops. In the test prototypes the gearbox ratio was altered to approximately 500:1, though this ratio is largely dependent on the associated motor etc. It should be envisaged that in commercially applied embodiments, purpose built or selected motors and gear box are likely to be adopted.

[0157] The output shaft (40) with gear box (39) is coupled with a purpose built shaft (41) which transmits rotation to the outer hinge (45) of lid (30) via the shaft (41) end portion (44). The shaft (41) is held in place by two pins (42, 43).

[0158] Basing torsion spring (46) is provided to act as a counter weight to the lid (30) so as to reduce the weight and load on the motor (38), and reduce power consumption. As can be appreciated, various types counter weight may be adopted, and may also be eliminated in some embodiments.

[0159] The right hand potion of FIG. 2 substantially replicates that of the left hand portion. A motor (53) and gear box (54) combination associated with the seat portion (31) is provided and transmit its output to a shaft assembly of similar but slightly different design to its counterpart. Bearings (51, 52) are provided to mount to this shaft. A counterweight in the form of a torsion spring (55) is also provided.

[0160] As should be appreciated the illustrated embodiment is based on work performed on a test prototype. It is envisaged that a commercial applied embodiment will typically substantially resemble the described embodiment, though various changes and modifications may be made thereto. For instance it is envisaged that the motor and gear box of specific design may be used. The hinge portion of an associated seat assembly may be modified to more readily allow for coupling of the output of the gear boxes to them and/or the shaft assembly. Counterweighting may be provided integrally in the seat and lid assembly rather than requiring the presence of an added counterweight spring such as a represented in FIG. 2. As can be appreciated various modifications which do not substantially affect the operation of the present invention, may be implemented according to standard practiced techniques.

EXAMPLE 2

[0161] A second embodiment of the present invention is illustrated in FIGS. 3 and 4. This has many features in
common with the embodiment of example 1, though differs in its use of proximity sensors to initiate a majority of action associated with the system.

[0162] In FIG. 4 can be seen the toilet pan (100), the toilet seat (101), and lid (102). Powered pivoting of the seat (101) and lid (102) is accomplished by a motor and motor controller assembly housed in the hinge portion (104) of the seat assembly. This arrangement is substantially the same as in example 1.

[0163] The example of FIG. 4 differs in that it includes a first sensor (110) and second sensor (111) which are used to initiate and control a number of actions associated with the toilet system. For instance, first sensor (110) is mounted in a forward looking position in the toilet cistern lid (114). This has an approximate range (indicated by line 116) of approximately 800 mm. This proximity sensor is angled slightly downwardly to also take into account small users of the toilet as well as adults. This downward angle is variable and should typically be such as to capture the head and/or upper torso of a small child standing in front of the toilet pan (100). This angle may be varied for other applications, or users other than in a typical domestic arrangement. Similarly the range 116 can be varied according to user requirement and need.

[0164] Sensor (111) is typically directed substantially upwardly and has a shorter range 117 of approximately 100 to 150 mm. Again this may be varied according to user choice and requirements. The angle may also be varied from vertical through directing it forwardly may give rise to false readings should someone be sitting on the toilet itself.

[0165] The sensors (110 and 111) are connected to a control circuit (120) which interprets their results and provides suitable output signals to drive motors associated with the hinged portion (104), and also motors (130) associated with the flush mechanism (131). Where separate flush mechanisms are provided within the cistern to accommodate half and full flushing, then separate motors and assemblies may be provided for each.

[0166] Also associated with the control apparatus (120) is a manual flush button (122) which allows the user to initiate manual flushing of the toilet. This may be followed by lowering of the seat and closing of the lid.

[0167] The sequence of operations can be varied but the preferred arrangement in the embodiment of FIG. 3 is as follows. First sensor (110) continually monitors if someone is approaching or positioned on the toilet. Assuming that the toilet is unoccupied, then someone stepping within range (see line 116) will trigger first sensor (110). The control circuitry (120) will then cause the motor associated with toilet seat lid (102) to effect raising of the lid.

[0168] If the user wishes to raise the seat (101) then they will typically pass their hand over the top of upper sensor (111) which, when activated, will cause the control circuitry (120) to effect raising of seat (101). If the user changes their mind they can again pass their hand over sensor (111) which causes the seat (101) to be lowered back down again. This sequence of operations can be repeated as often as user desires, or the control circuitry may have a limit as to how many times this operation may be performed.

[0169] In the embodiment of FIG. 4 the flushing of the toilet is typically automatic. When the user has finished their business they may either use the manual flush button (122), or step away from the toilet. If they step away from the toilet then first proximity sensor (110) will detect that the toilet is no longer occupied. After an optional short delay, nominally around three seconds, a flushing sequence will be initiated.

[0170] Regardless of whether a flushing sequence is initiated by sensor (110) or manual override (122), the control apparatus will first determine from feedback from the motor control housed in hinge (104) whether the seat (101) is in an up position. If it is, then only a half flush will be performed. If the seat is down then the cistern will attempt to perform a full flush.

[0171] After a short delay, allowing the user to determine whether the flush was successful in emptying the contents of the pan, the toilet seat (101) will be lowered (though the seat may be lowered at the beginning of the flush sequence, with or during the flush sequence). This is then followed by lowering of the lid (102). At this stage the toilet considers itself unoccupied and awaits the approach of the next person.

[0172] A variety of mechanisms may be used to effect flushing of the toilet. One simple and preferred arrangement is to use a motor with inbuilt gearbox (130) which drives a cam (133) with a pin (134) connected to a linkage (135) to the flush mechanism (131). Rotation of the motor/gearbox (130) causes the pin (134) to raise and lower thereby effecting, through linkage (135), a flushing operation. A switch or sensing device (136) adjacent the cam determines the position of the cam so that it comes to stop in the appropriate rest position, and is ready for another cycle. Typically the motor (130) is controlled by controller (120).

[0173] The motors associated with the hinge assembly (104) may be the same as in example 1 though there are other various equivalents available. The motor (130) associated with automatic flushing can also vary according to what is available on the market. In particular a motor currently considered suitable is manufactured by R S Australia, part number 245-6118. This is a 12 volt motor with an 18:1 reduction and associated gearbox.

[0174] As an optional extra, a remote control unit (200) may be provided (see FIG. 3). This may include manual buttons (201) for activating various actions, including substituting the actions of the second proximity sensor. The first proximity sensor may also be mounted in the remote control unit (200), which may have a better field of view of detecting the approach or presence of someone.

[0175] Various optional additions may be included into this and other embodiments. The presence of a sanitary spray unit has been mentioned. Other options include disinfectant release into the flushing water stream. Another option is an automated occupancy indicator, which indicates when the stall or toilet is occupied. This may be an illuminated sign on the door. Interaction with door locking mechanisms is also possible. The door lock, even if manually operated, may also include a status sensor to advise the control apparatus when the stall is occupied.

[0176] Emergency call buttons may also be included in the apparatus, such as in a remote control unit. This may be more of an option for the elderly or in hospitals. As an extension of this, an emergency call may be made if it is detected that the toilet is occupied for more than a predetermined period of time. A pre-warning signal may be
sounded with the option for the user to reset the timer if all is okay. If the reset is not activated within a certain period, then an emergency call is made.

[0177]. Aspects of the present invention have been described by way of example only and it is intended that modifications and additions made thereto without departing from the spirit or the scope thereof.

[0178]. It is also to be noted that the word “comprise”, and variations thereof, wherever used in the specification are to be construed in the inclusive rather than exclusive sense. That is to say, something which is said to comprise certain members may also include additional members or elements theretof. Hence, “comprise” and its variations should not be construed in a restricted sense such that excludes the presence of any further features over and above the listed or stated associated features or integers.

1-40. (canceled)
41. A motorised toilet seat assembly comprising a hinged seat and a hinged lid, the assembly including at least one motor and associated drive assembly for transmitting rotational drive to effect the raising and lowering of each of said hinged seat and hinged lid;

there being present a controller for controlling a said motor and associated drive assembly to perform at least the functions of:

i) raising the hinged lid;

ii) raising the seat;

iii) lowering the hinged lid;

iv) lowering the seat;

the toilet seat assembly including provision for connection of the controller to at least one sensor, a said sensor being capable of detecting either or both of the presence of or an action of a user of the toilet seat assembly.

42. A motorised toilet seat assembly as claimed in claim 41 in which a said motor and associated drive assembly is housed within the hinge arrangement of the toilet seat assembly, or between hinges present on the toilet seat assembly.

43. A motorised toilet seat assembly as claimed in claim 41 in which a said motor and associated drive assembly has an rotating output shaft which is coaxial with a hinge relating to either or both of said hinged lid or hinged seat.

44. A motorised toilet seat assembly as claimed in claim 41 in which there is a separate motor and associated drive assembly for each of said hinged lid and said hinged seat.

45. A motorised toilet seat assembly as claimed in claim 41 in which said functions of raising and lowering each of said hinged lid and hinged seat can be performed independently.

46. A motorised toilet seat assembly as claimed in claim 41 in which:

a further activation of a said sensor then causes a lowered hinged seat to be raised.

47. A motorised toilet seat assembly as claimed in claim 41 in which at least one of the following occurs:

a predetermined period of time after a sensor comprising a motion sensor indicates an occupant has left, at least a said hinged seat is lowered if it is in a raised position;

a predetermined period of time after a sensor comprising a motion sensor indicates an occupant has left, at least a said hinged lid is lowered if it is in a raised position;

a predetermined period of time after a sensor comprising a motion sensor indicates an occupant has left, a flushing mechanism for automatically flushing the toilet is activated;

upon detection of flushing of the toilet, a said hinged seat is lowered if it is in a raised position;

upon detection of flushing of the toilet, a said hinged lid is lowered if it is in a raised position;

48. A motorised toilet seat assembly as claimed in claim 41 in which there is present means for effecting flushing of the toilet, and which can be operated by activation of a sensor;

49. A motorised toilet seat assembly as claimed in claim 41 in which said controller includes load sensing means for a motor, able to determine if a motor encounters a resistance.

50. A motorised toilet seat assembly as claimed in claim 49 in which said controller stops operation of the motor if a resistance is detected.

51. A motorised toilet seat assembly as claimed in claim 49 in which said controller either or both:

reverses an action for raising or lowering a hinged seat or hinged lid if it is determined that the resistance is encountered part way through the raising or lowering operation;

completes a raising or lowering operation of a hinged seat or hinged lid if it is determined that a user manually alters the position of the hinged seat or hinged lid from a fully down or fully raised position.

52. A motorised toilet seat assembly as claimed in claim 41 in which there is present sanitary spray means which sprays a sanitising material within the toilet bowl, under the control of the controller.

53. A motorised toilet seat assembly as claimed in claim 41 which includes means for sending an emergency call according to either or both of:

the user activates the controller to do so;

if a user occupies the toilet seat assembly for more than a predetermined period of time.

54. A motorised toilet seat assembly as claimed in claim 41 which is powered by one or more of:

a remote power source such as an electric cell or battery;
a reduced voltage from a mains power source;

* * * * *